

Qwizdom Inc.

Q4 RF

January 25, 2005

Report No. PROU0010

Report Prepared By



www.nwemc.com
1-888-EMI-CERT

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EMC Test Report



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test
Issue Date: January 25, 2005
Qwizdom Inc
Q4 RF

Emissions			
Specification	Test Method	Pass	Fail
FCC 15.247(a)(2) Occupied Bandwidth:2004	ANSI C63.4:2003	☒	☐
FCC 15.247(b)(3) Output Power:2004	ANSI C63.4:2003	☒	☐
FCC 15.247(d) Band Edge Compliance:2004	ANSI C63.4:2003	☒	☐
FCC 15.247(d) Out of Band Emissions:2004	ANSI C63.4:2003	☒	☐
FCC 15.247(d) Spurious Radiated Emissions:2004	ANSI C63.4:2003	☒	☐
FCC 15.247(e) Power Spectral Density:2004	ANSI C63.4:2003	☒	☐

Modifications made to the product

See the Modifications section of this report

Test Facility

The measurement facilities used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124
Phone: (503) 844-4066
Fax: 844-3826

The sites have been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada.

Approved By:

Don Fecteau, IS Manager

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

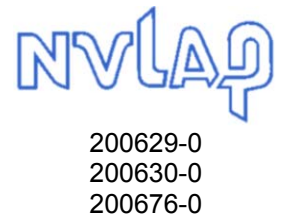
Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

FCC: Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.



NVLAP: Northwest EMC, Inc. is recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 89/336/EEC, ANSI C63.4, MIL-STD 461E, DO-160D and SAE J1113. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.



Industry Canada: Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS 212, Issue 1 (Provisional) and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements.



CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement



TÜV Product Service: Included in TÜV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements. Certificate No. USA0401C



TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.



NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).



Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.



Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body. (NVLAP)



VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (*Registration Nos. - Hillsboro: C-1071 and R-1025, Irvine: C-2094 and R-1943, Newberg: C-1877 and R-1760, Sultan: R-871, C-1784 and R-1761*)



BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.



GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification



SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/scope.asp>

How important is it to understand performance criteria?

It is the responsibility of the test laboratory to observe the results of the tests that are performed and to accurately report those results. As the responsible party (manufacturer, importer, etc) it is your responsibility to take those results, compare them against the specifications and standards, then, if appropriate make a declaration of conformity. As the responsible party it makes sense that you are fully aware of the requirements, how your device performs when tested to those requirements, and what information is being used to declare conformity.

To better assist you in making those conformity decisions, Northwest EMC has adopted a very simple, yet very clear performance assessment procedure. The following criteria is used when performing immunity or susceptibility tests:

Performance Criteria 1:

- ❑ The EUT exhibited no change in performance when operating as specified by the manufacturer. In this case no changes were observed during the test.
- ❑ In most cases this would be equivalent to Performance Criteria A. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, no changes were observed. Basically nothing happened.

Performance Criteria 2:

- ❑ The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment recovered without any operator intervention, once the test signal was removed. The data sheets will detail the exact phenomena observed.
- ❑ In most cases this would be equivalent to Performance Criteria B. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. The EUT was able to recover from those changes without any operator intervention, once the test signal was removed.

Performance Criteria 3:

- ❑ The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment required some operator intervention in order to recover. This intervention may be in the form of changing EUT settings, or even resetting the system. The data sheets will detail the exact phenomena observed.
- ❑ In most cases this would be equivalent to Performance Criteria C. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. The EUT required some sort of operator intervention to recover. There was no permanent damage and the EUT appeared to function normally after completion test.

Performance Criteria 4:

- ❑ The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment was damaged and would not recover. The data sheets will detail the exact phenomena observed.
- ❑ In most cases there is no specific criterion to compare this to, it typically ends the test. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. There was no recovery; the equipment would no longer function as intended.

Each of the standards and specifications has unique performance criteria. In order to make an accurate assessment, one must compare the test results provided with the specific performance criteria. **To ensure that a responsible party is compliant with the specifications, one must read and understand those specifications. Provided below is a sample performance criteria, taken from EN 61000-6-1.**

EN 61000-6-1 Performance Criteria

Performance Criteria A: *The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

Performance Criteria B: *The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

Performance Criteria C: *Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of controls.*

How should a device perform in order for a declaration of conformity to be made?

As already stated, it is the responsible party that must interpret and understand the results in such a way that a declaration of conformity is made. Having said that, we are often asked to render our opinion as to how a device should perform. Our recommendation simply follows the standards, as can be referenced below. Most of the standards and specifications offer the same performance criterion shown below as their requirements.

Test	Performance Criteria typically specified by the Standard	Equivalent Northwest EMC Performance Criteria
ESD	Performance Criteria B	Performance Criteria 1 or 2
Radiated RF	Performance Criteria A	Performance Criteria 1
EFT/Burst	Performance Criteria B	Performance Criteria 1 or 2
Surge	Performance Criteria B	Performance Criteria 1 or 2
Conducted RF	Performance Criteria A	Performance Criteria 1
Magnetic Field	Performance Criteria A	Performance Criteria 1
Voltage Dips and Variations	Performance Criteria B & C	Performance Criteria 1, 2, or 3

What is measurement uncertainty?

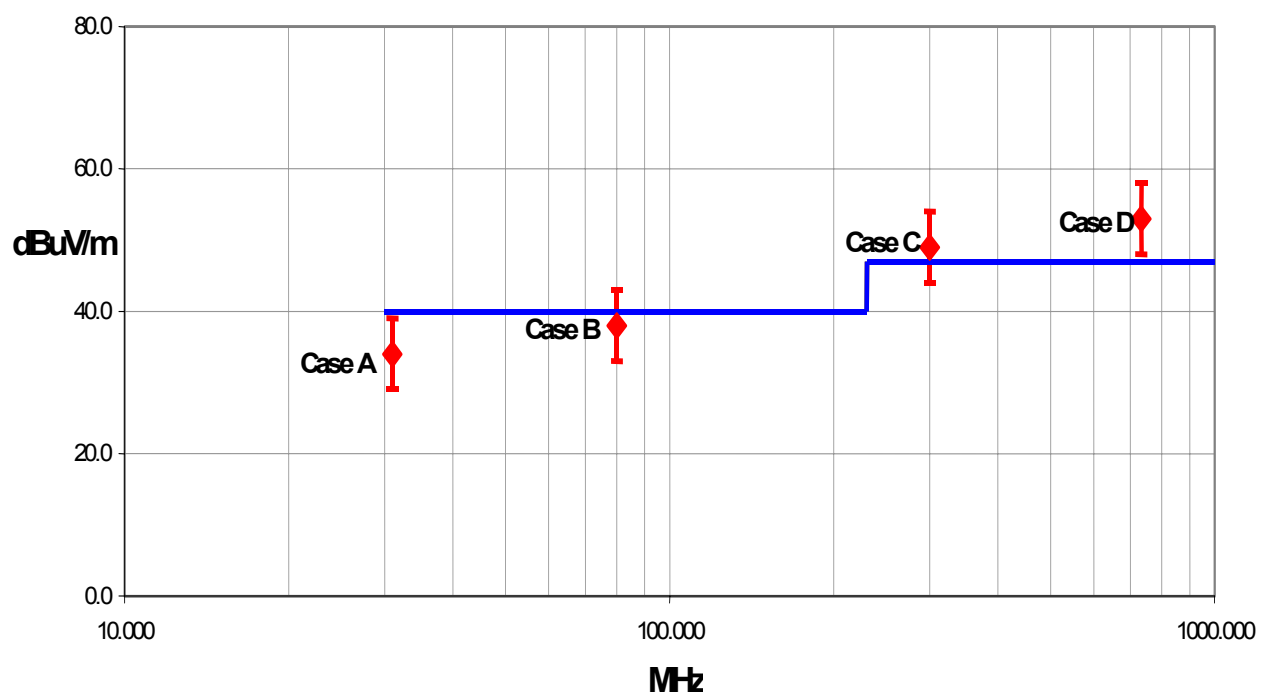
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its “true” value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- “ISO Guide to the Expression of Uncertainty in Measurements”, October 1993
- “NIS81: The Treatment of Uncertainty in EMC Measurements”, May 1994
- “IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques”, December 2000

How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and – measurement uncertainty, then test results can be interpreted from the diagram below.

**Test Result Scenarios:**

Case A: Product complies.

Case B: Product conditionally complies. It is not possible to say with 95% confidence that the product complies.

Case C: Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.

Case D: Product does not comply.

Radiated Emissions ≤ 1 GHz

Value (dB)

Test Distance	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 - 2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

Radiated Emissions > 1 GHz

Value (dB)

Test Distance	Probability Distribution	Without High Pass Filter		With High Pass Filter	
		3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.29 - 1.25	+ 1.38 - 1.35	+ 1.38 - 1.35
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k=2)	+ 2.57 - 2.51	+ 2.57 - 2.51	+ 2.76 - 2.70	+ 2.76 - 2.70

Conducted Emissions

Test Distance	Probability Distribution	Value (+/- dB)	
		3m	10m
Combined standard uncertainty $u_c(y)$	normal	1.48	1.48
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.97	2.97

Radiated Immunity

Test Distance	Probability Distribution	Value (+/- dB)	
		3m	10m
Combined standard uncertainty $u_c(y)$	normal	1.05	1.05
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.11	2.11

Conducted Immunity

Test Distance	Probability Distribution	Value (+/- dB)	
		3m	10m
Combined standard uncertainty $u_c(y)$	normal	1.05	1.05
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.10	2.10

Legend

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: k . This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then $k=3$ (CL of 99.7%) can be used. Please note that with a coverage factor of one, $u_c(y)$ yields a confidence level of only 68%.

**California****Orange County Facility****Labs OC01 – OC13**

41 Tesla Ave.
Irvine, CA 92618
(888) 364-2378
FAX (503) 844-3826

**Oregon****Evergreen Facility****Labs EV01 – EV10**

22975 NW Evergreen Pkwy.,
Suite 400
Hillsboro, OR 97124
(503) 844-4066
FAX (503) 844-3826

**Oregon****Trails End Facility****Labs TE01 – TE03**

30475 NE Trails End Lane
Newberg, OR 97132
(503) 844-4066
FAX (503) 537-0735

**Washington****Sultan Facility****Labs SU01 – SU07**

14128 339th Ave. SE
Sultan, WA 98294
(888) 364-2378
FAX (360) 793-2536

Party Requesting the Test

Company Name:	Product Creation Studio
Address:	5425 Ballard Ave NW
City, State, Zip:	Seattle, WA 98107
Test Requested By:	Scott Thielman
Model:	Q4 RF
First Date of Test:	December 22, 2004
Last Date of Test:	January 8, 2005
Receipt Date of Samples:	December 21, 2004
Equipment Design Stage:	Pre-Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	1 MHz, 6 MHz, 16 MHz, 48 MHz, 65 MHz, 256 MHz, 2.45 GHz
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Functional Description of the EUT (Equipment Under Test):

EUT is a 20 button remote for an Audience Response System (ARS).
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Client Justification for EUT Selection:

The product is an engineering sample, representative of the final product.
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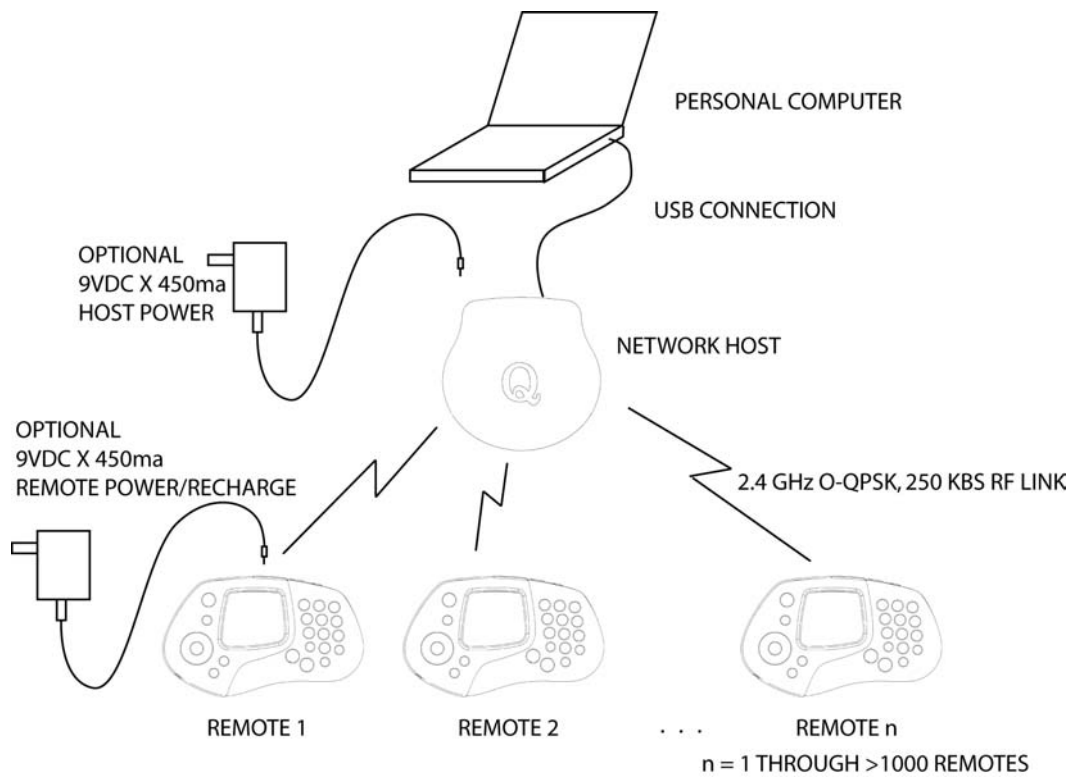
Client Justification for Test Selection:

These test satisfy the requirements for FCC 15.247 Certification. There are no provisions for connection to the AC power mains either directly, or indirectly via a host unit. The EUT is powered from AA alkaline batteries.

EUT Information

The Audience Response System (ARS) consists of the elements shown in Figure 1. A computer (laptop or desktop) connects to the network host via a USB connection. The host obtains its power from the USB connection and alternately from a regulated 9VDC wall transformer. The network host communicates to multiple audience remotes via an IEEE 802.15.4 compliant RF link. The teacher remote, Q5 RF, has more buttons and a larger graphical display, while the student remote, Q4 RF, has fewer buttons and smaller LCD. The remotes accept user feedback via the keypad and displays information on an LCD. The Q5 remotes are powered by rechargeable batteries and can be powered and recharged via a 9VDC regulated wall transformer. Two AA alkaline batteries power the Q4 remotes.

Figure 1 – RF Network System Overview



Equipment modifications					
Item	Test	Date	Modification	Note	Disposition of EUT
1	Out of Band Radiated Emissions	12/22/2004	No EMI suppression devices were added or modified during this test.	Same configuration as delivered	EUT remained at Northwest EMC.
2	Radiated Spurious Emissions	12/22/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
3	Band Edge Compliance	01/04/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
4	Occupied Bandwidth	01/04/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
5	Power Spectral Density	01/04/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
6	Output Power	01/08/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

Typical

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

Battery

Frequency Range Investigated

Start Frequency	30 MHz	Stop Frequency	26 GHz
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Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing including channel, mode, and power.			

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
EUT- Q4 RF	Quizdom, Inc.	Q4 RF	EMC 0x100001

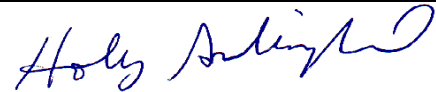
Measurement Equipment					
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Antenna, Horn	EMCO	3160-09	AHG	NCR	NA
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/08/2003	15 mo
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	NA
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	10/08/2003	15 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
Pre-Amplifier	AR	LN1000A	APS	02/05/2004	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
High Pass Filter	Micro-Tronics	HPM50111	HFO	04/13/2004	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/02/2004	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/02/2004	13 mo

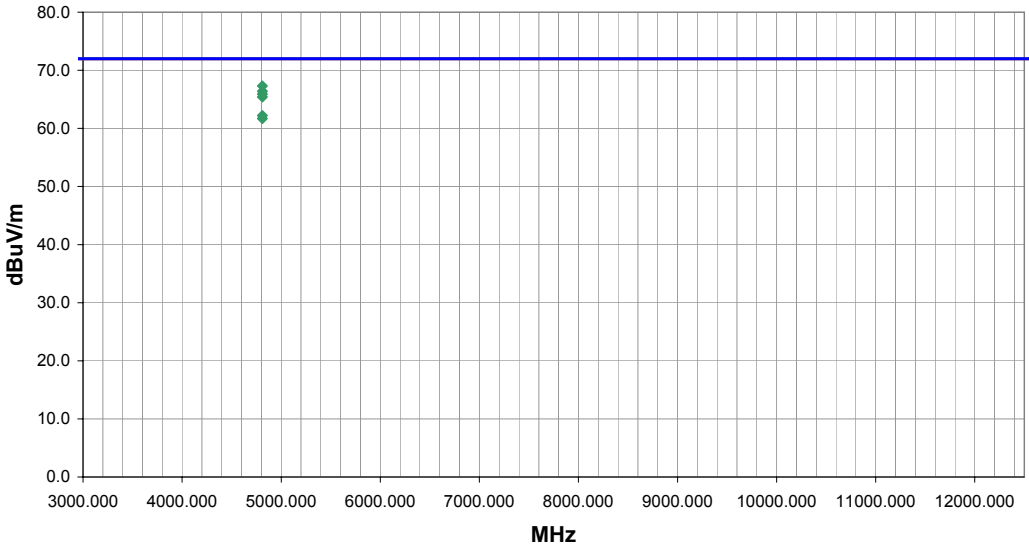
Test Description

Requirement: Per 47 CFR 15.247(d), in any 100kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The EUT was configured for low, mid, and high transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.4:2003). A preamp and suitable attenuation were used for this test in order to provide sufficient measurement sensitivity.

Completed by:



NORTHWEST		ACQ 2005.1.3											
EMC		Out of Band Radiated Emissions											
EUT: Q4 RF		Work Order: PROU0010											
Serial Number: EMC 0x100001		Date: 12/22/04											
Customer: Product Creation Studio		Temperature: 24											
Attendees: None		Humidity: 23%											
Cust. Ref. No.:		Barometric Pressure 30.27											
Tested by: Dan Haas		Power: Battery											
		Job Site: EV01											
TEST SPECIFICATIONS													
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004		Method: ANSI C63.4:2003											
SAMPLE CALCULATIONS													
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation													
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator													
COMMENTS													
In any 100kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band.													
EUT OPERATING MODES													
Low channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS													
Pass			Run # 7										
Other		 Tested By:											
													
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
4810.000	64.0	3.3	17.0	1.3	3.0	0.0	V-Horn	PK	0.0	67.3	72.0	-4.7	EUT Vertical
4810.000	63.1	3.3	98.0	1.3	3.0	0.0	V-Horn	PK	0.0	66.4	72.0	-5.6	EUT on its side.
4810.000	62.6	3.3	19.0	1.2	3.0	0.0	H-Horn	PK	0.0	65.9	72.0	-6.1	EUT Horizontal
4810.000	62.1	3.3	170.0	1.2	3.0	0.0	H-Horn	PK	0.0	65.4	72.0	-6.6	EUT on its side.
4810.000	58.9	3.3	227.0	1.2	3.0	0.0	V-Horn	PK	0.0	62.2	72.0	-9.8	EUT Horizontal
4810.000	58.4	3.3	158.0	1.7	3.0	0.0	H-Horn	PK	0.0	61.7	72.0	-10.3	EUT Vertical

EUT:	Q4 RF	Work Order:	PROU0010
Serial Number:	EMC 0x100001	Date:	12/22/04
Customer:	Product Creation Studio	Temperature:	23
Attendees:	None	Humidity:	33%
Cust. Ref. No.:		Barometric Pressure:	30.5
Tested by:	Dan Haas	Power:	Battery
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	FCC 15.247(d) Spurious Radiated Emissions:2004
Method:	ANSI C63.4:2003

SAMPLE CALCULATIONS	
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation	
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator	

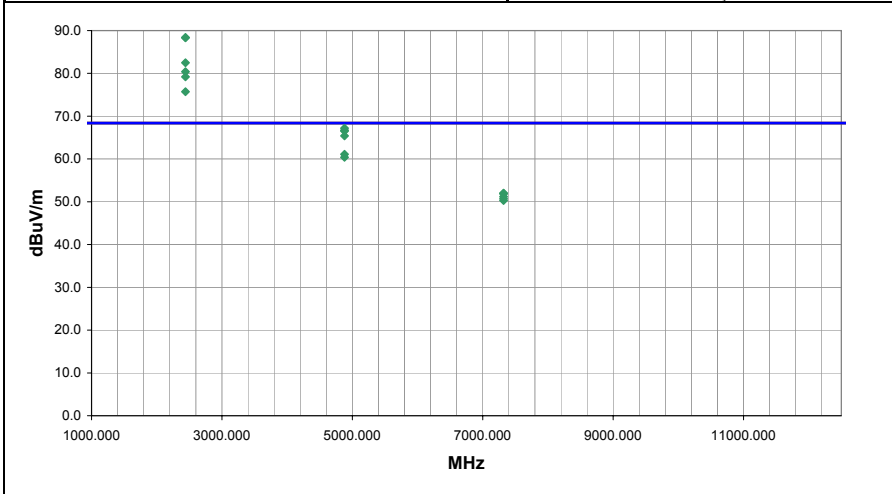
COMMENTS
In any 100kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band.

EUT OPERATING MODES
Mid channel

DEVIATIONS FROM TEST STANDARD
No deviations.

RESULTS	Run #
Pass	8

Other	Tested By:
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2440.000	80.6	-2.2	180.0	1.3	3.0	10.0	H-Horn	PK	0.0	88.4	n/a	n/a	Fundamental Emission. EUT vertical
2440.000	80.5	-2.2	188.0	1.3	3.0	10.0	V-Horn	PK	0.0	88.3	n/a	n/a	Fundamental Emission. EUT on its side
2440.000	74.7	-2.2	94.0	1.1	3.0	10.0	V-Horn	PK	0.0	82.5	n/a	n/a	Fundamental Emission. EUT horizontal
2440.000	72.6	-2.2	213.0	1.3	3.0	10.0	H-Horn	PK	0.0	80.4	n/a	n/a	Fundamental Emission. EUT horizontal
2440.000	71.4	-2.2	136.0	1.2	3.0	10.0	V-Horn	PK	0.0	79.2	n/a	n/a	Fundamental Emission. EUT vertical
2440.000	67.9	-2.2	273.0	1.3	3.0	10.0	H-Horn	PK	0.0	75.7	n/a	n/a	Fundamental Emission. EUT on its side
4880.000	63.6	3.6	153.0	1.2	3.0	0.0	H-Horn	PK	0.0	67.2	68.4	-1.2	EUT Horizontal
4880.000	63.1	3.6	8.0	1.4	3.0	0.0	V-Horn	PK	0.0	66.7	68.4	-1.7	EUT Vertical
4880.000	62.9	3.6	109.0	1.3	3.0	0.0	V-Horn	PK	0.0	66.5	68.4	-1.9	EUT on its side.
4880.000	61.8	3.6	169.0	1.2	3.0	0.0	H-Horn	PK	0.0	65.4	68.4	-3.0	EUT on its side.
4880.000	57.5	3.6	341.0	1.2	3.0	0.0	V-Horn	PK	0.0	61.1	68.4	-7.3	EUT Horizontal
4880.000	56.8	3.6	156.0	1.3	3.0	0.0	H-Horn	PK	0.0	60.4	68.4	-8.0	EUT Vertical
7320.000	41.5	10.5	145.0	1.3	3.0	0.0	H-Horn	PK	0.0	52.0	68.4	-16.4	EUT Vertical
7320.000	41.4	10.5	243.0	1.7	3.0	0.0	V-Horn	PK	0.0	51.9	68.4	-16.5	EUT on its side.
7320.000	41.4	10.5	156.0	1.1	3.0	0.0	V-Horn	PK	0.0	51.9	68.4	-16.5	EUT Horizontal
7320.000	40.7	10.5	62.0	2.2	3.0	0.0	H-Horn	PK	0.0	51.2	68.4	-17.2	EUT on its side.
7320.000	40.2	10.5	103.0	1.2	3.0	0.0	V-Horn	PK	0.0	50.7	68.4	-17.7	EUT Vertical
7320.000	39.8	10.5	204.0	1.3	3.0	0.0	H-Horn	PK	0.0	50.3	68.4	-18.1	EUT Horizontal

EUT:	Q4 RF	Work Order:	PROU0010
Serial Number:	EMC 0x100001	Date:	12/22/04
Customer:	Product Creation Studio	Temperature:	23
Attendees:	None	Humidity:	33%
Cust. Ref. No.:		Barometric Pressure:	30.5
Tested by:	Dan Haas	Power:	Battery
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	FCC 15.247(d) Spurious Radiated Emissions:2004
Method:	ANSI C63.4:2003

SAMPLE CALCULATIONS	
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation	
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator	

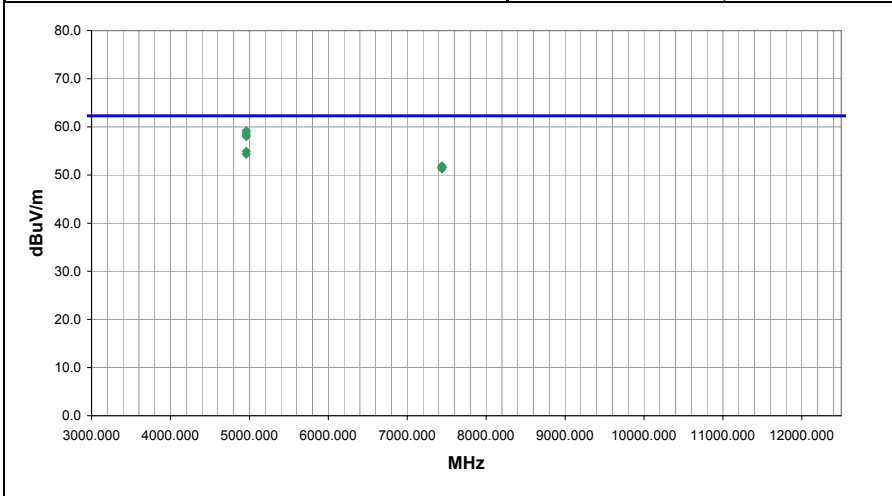
COMMENTS
In any 100kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band.

EUT OPERATING MODES
High channel

DEVIATIONS FROM TEST STANDARD
No deviations.

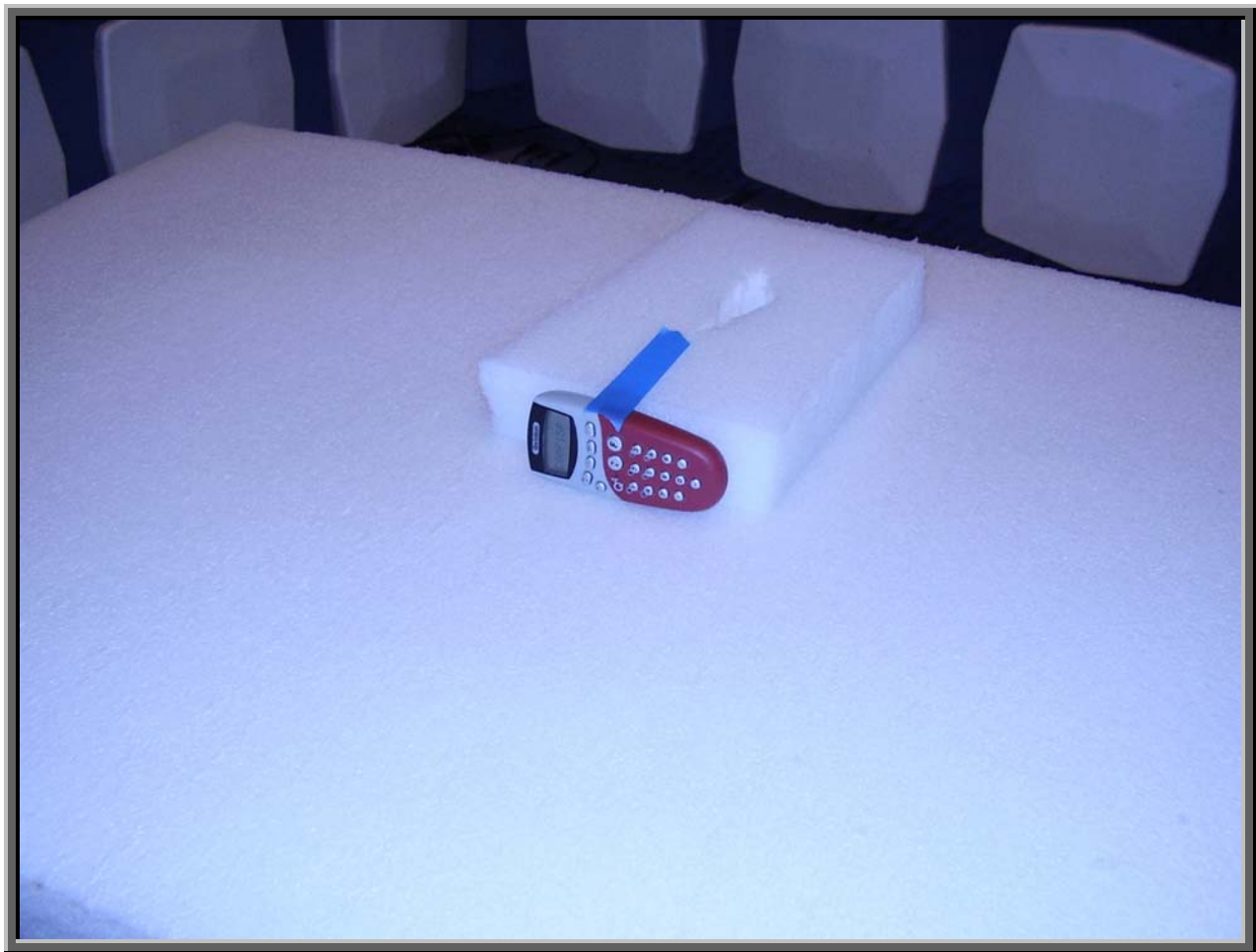
RESULTS	Run #
Pass	9

Other	Tested By:
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
4960.000	55.6	3.6	199.0	1.3	3.0	0.0	H-Horn	PK	0.0	59.2	62.3	-3.1	Out of Band Radiated Emissions. EUT on its side
4960.000	55.2	3.6	8.0	1.2	3.0	0.0	V-Horn	PK	0.0	58.8	62.3	-3.5	Out of Band Radiated Emissions. EUT vertical
4960.000	54.7	3.6	141.0	1.1	3.0	0.0	V-Horn	PK	0.0	58.3	62.3	-4.0	Out of Band Radiated Emissions. EUT on its side
4960.000	54.4	3.6	203.0	1.3	3.0	0.0	H-Horn	PK	0.0	58.0	62.3	-4.3	Out of Band Radiated Emissions. EUT horizontal
4960.000	51.3	3.6	325.0	1.8	3.0	0.0	H-Horn	PK	0.0	54.9	62.3	-7.4	Out of Band Radiated Emissions. EUT vertical
4960.000	50.7	3.6	128.0	1.2	3.0	0.0	V-Horn	PK	0.0	54.3	62.3	-8.0	Out of Band Radiated Emissions. EUT horizontal
7440.000	40.8	11.1	211.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.9	62.3	-10.4	EUT Vertical
7440.000	40.5	11.1	86.0	1.9	3.0	0.0	V-Horn	PK	0.0	51.6	62.3	-10.7	EUT on its side
7440.000	40.5	11.1	224.0	1.2	3.0	0.0	V-Horn	PK	0.0	51.6	62.3	-10.7	EUT Vertical
7440.000	40.5	11.1	191.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.6	62.3	-10.7	EUT on its side
7440.000	40.4	11.1	305.0	1.2	3.0	0.0	V-Horn	PK	0.0	51.5	62.3	-10.8	EUT Horizontal
7440.000	40.2	11.1	248.0	1.9	3.0	0.0	H-Horn	PK	0.0	51.3	62.3	-11.0	EUT Horizontal





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Channels in Specified Band Investigated:

Low

High

Operating Modes Investigated:

Typical

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

120VAC, 60Hz

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	Unknown
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Description

The system was tested using standard operating production software to exercise the functions of the device during the testing including channel, mode, and power.

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
EUT- Q4 RF	Quizdom, Inc.	Q4 RF	EMC 0x100001

Measurement Equipment

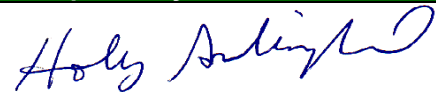
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo

Test Description

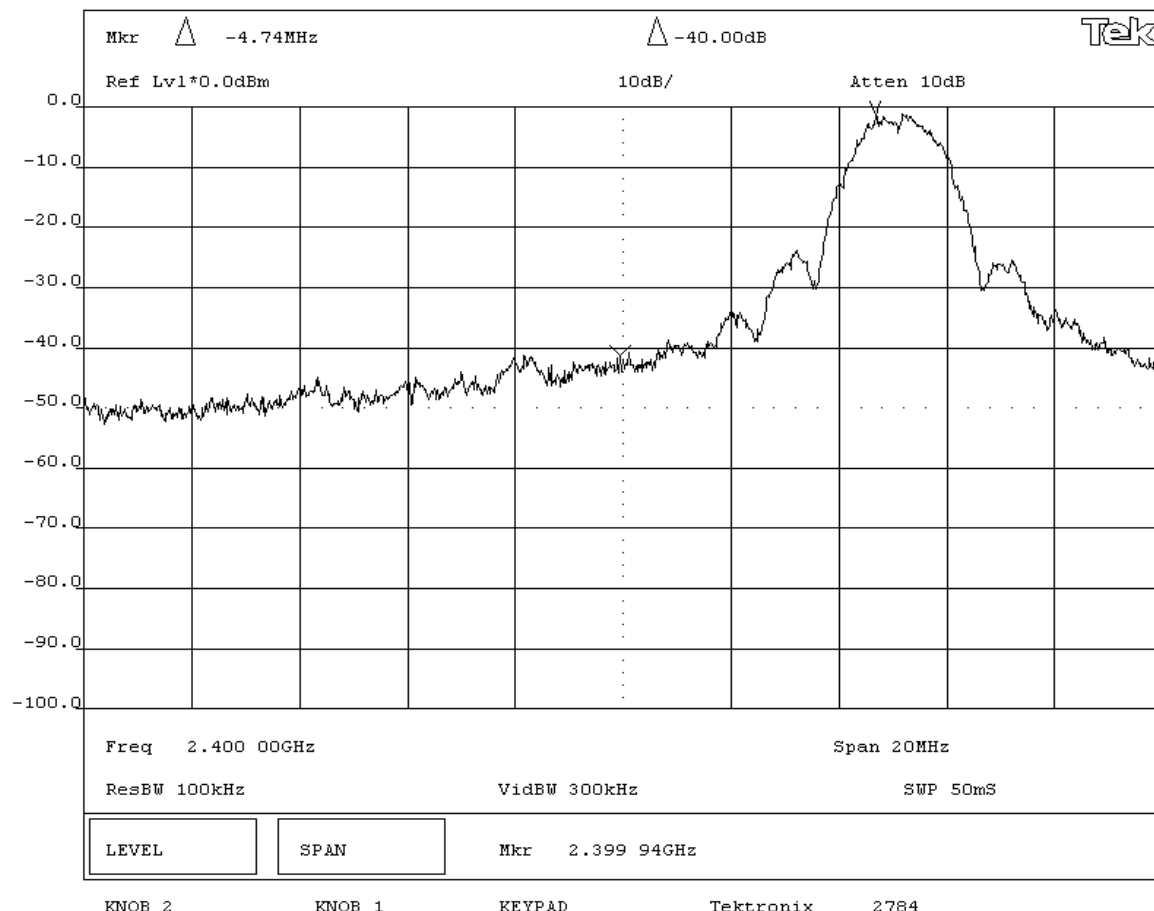
Requirement: Per 47 CFR 15.247(d), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The peak output power was measured with the EUT set to low, mid, and high transmit frequencies. The EUT was transmitting at its maximum output power and data rate.

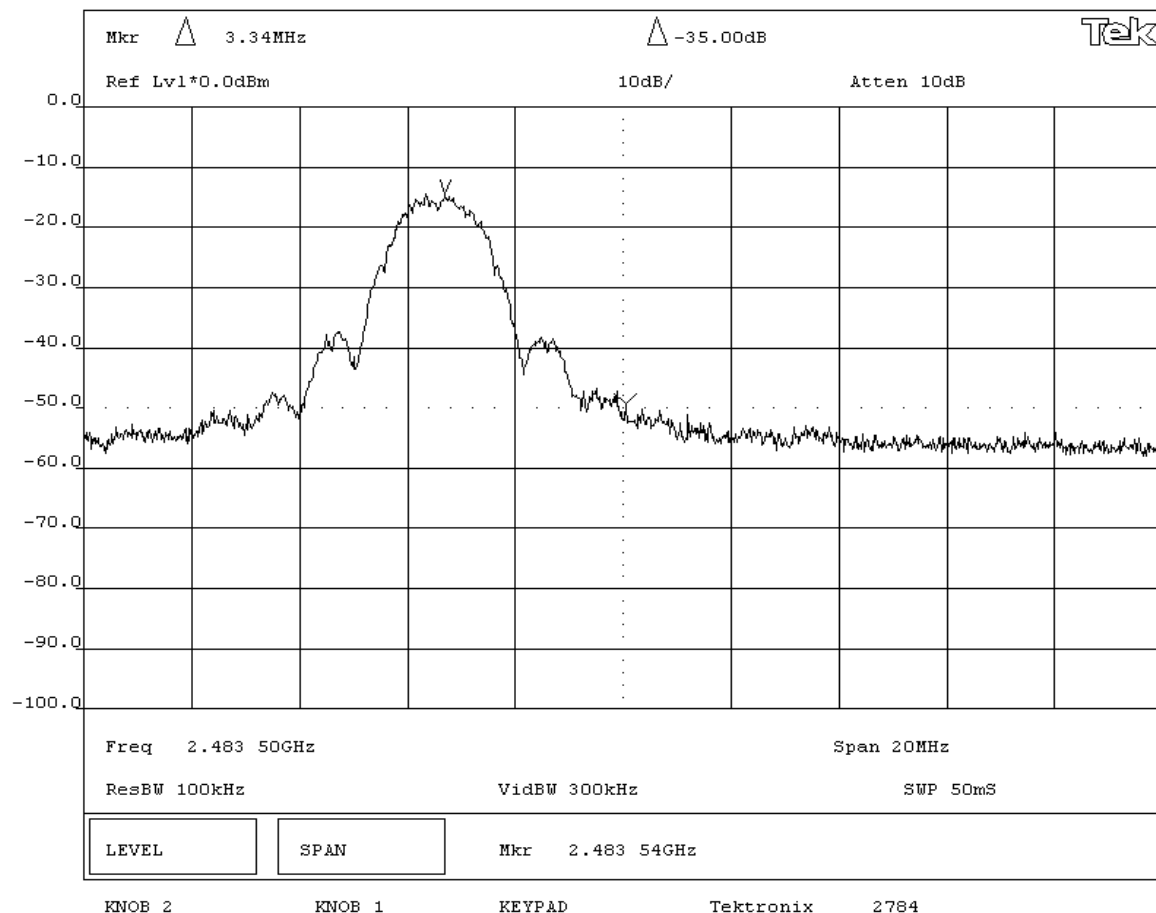
The measurement was made at a 3 meter test distance. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at its maximum data rate in a no hop mode. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from at least 5 MHz below the band edge to at least 5 MHz above the band edge.

Completed by:

NORTHWEST EMC				EMISSIONS DATA SHEET				Rev BETA 01/30/01	
EUT: Q4 RF				Work Order: PROU0010					
Serial Number: EMC 0x100001				Date: 01/04/05					
Customer: Product Creation Studio				Temperature: 23°C					
Attendees: None				Tested by: Rod Peloquin				Humidity: 25% RH	
Customer Ref. No.: N/A				Power: Battery				Job Site: EV01	
TEST SPECIFICATIONS									
Specification: 47 CFR 15.247(d)			Year: 2004		Method: FCC 97-114, ANSI C63.4			Year: 2003	
SAMPLE CALCULATIONS									
COMMENTS									
EUT OPERATING MODES									
Modulated at maximum data rate									
DEVIATIONS FROM TEST STANDARD									
None									
REQUIREMENTS									
Maximum level of any spurious emission at the edge of the authorized band is 20 dB down from the fundamental									
RESULTS									
Pass				AMPLITUDE -40 dB					
SIGNATURE									
 Tested By: _____									
DESCRIPTION OF TEST									
Band Edge Compliance - Low Channel									



NORTHWEST EMC				EMISSIONS DATA SHEET				Rev BETA 01/30/01	
EUT: Q4 RF				Work Order: PROU0010					
Serial Number: EMC 0x100001				Date: 01/04/05					
Customer: Product Creation Studio				Temperature: 23°C					
Attendees: None				Tested by: Rod Peloquin		Humidity: 25% RH			
Customer Ref. No.: N/A				Power: Battery		Job Site: EV01			
TEST SPECIFICATIONS									
Specification: 47 CFR 15.247(d)				Year: 2004		Method: FCC 97-114, ANSI C63.4		Year: 2003	
SAMPLE CALCULATIONS									
COMMENTS									
EUT OPERATING MODES									
Modulated at maximum data rate									
DEVIATIONS FROM TEST STANDARD									
None									
REQUIREMENTS									
Maximum level of any spurious emission at the edge of the authorized band is 20 dB down from the fundamental									
RESULTS									
				AMPLITUDE					
Pass				-35.0 dB					
SIGNATURE									
 Tested By: _____									
DESCRIPTION OF TEST									
Band Edge Compliance - High Channel									





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

Typical

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

120VAC, 60Hz

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing including channel, mode, and power.			

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
EUT- Q4 RF	Quizdom, Inc.	Q4 RF	EMC 0x100001

Measurement Equipment

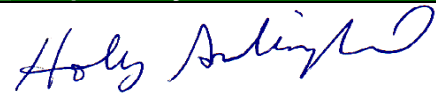
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo

Test Description

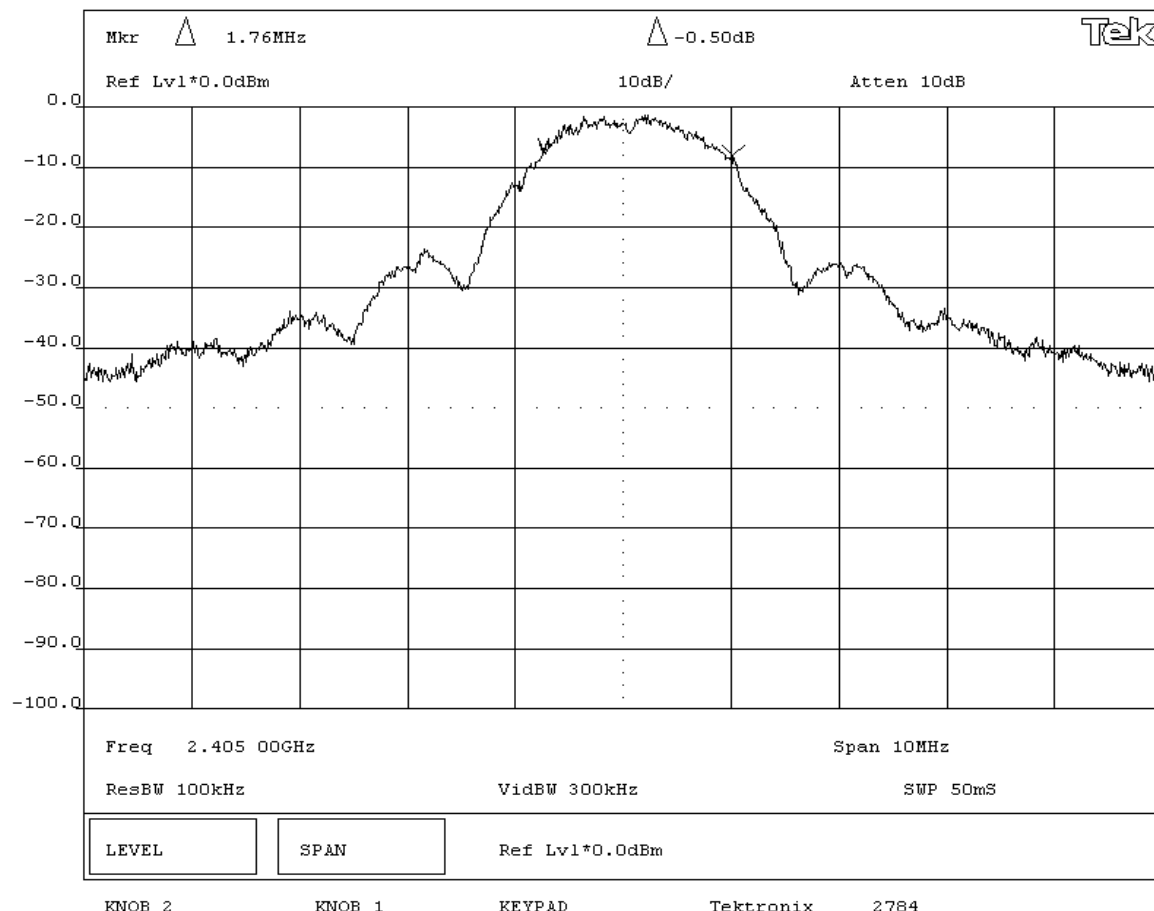
Requirement: Per 47 CFR 15.247(a)(2), the 6 dB bandwidth of a direct sequence channel must be at least 500kHz. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The occupied bandwidth was measured with the EUT set to low, mid, and high transmit frequencies. The EUT was transmitting at its maximum output power and data rate.

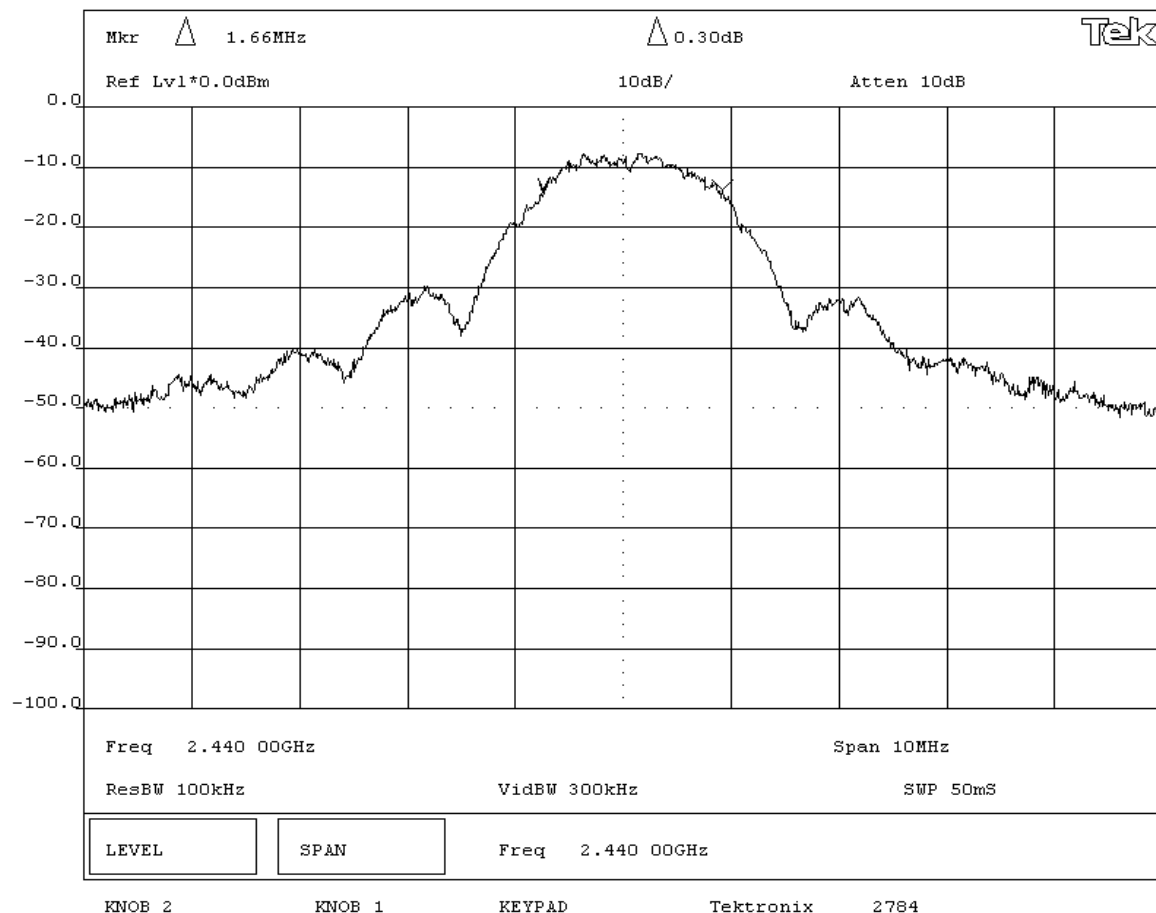
The measurement was made at a 3 meter test distance. The field strength was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.4:2003).

Completed by:

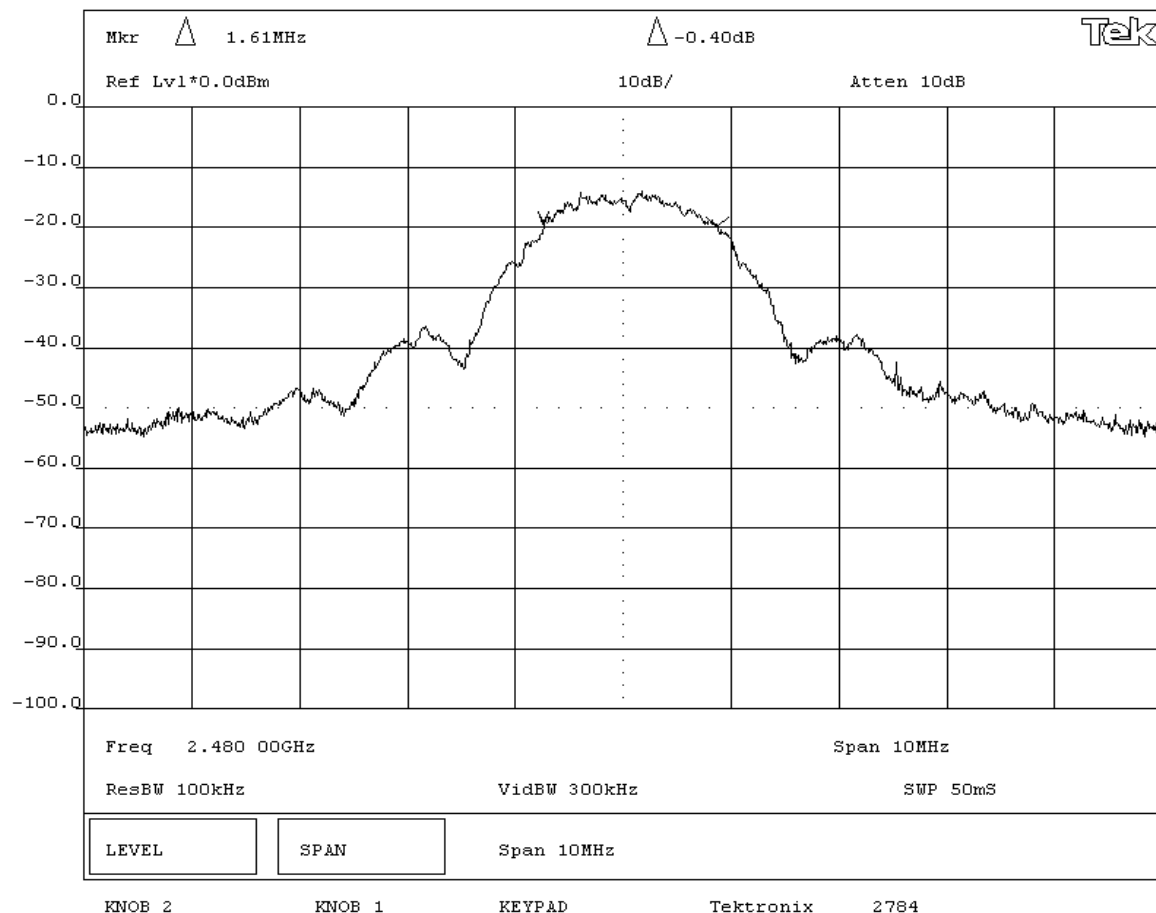
NORTHWEST EMC				EMISSIONS DATA SHEET				Rev BETA 01/30/01	
EUT: Q4 RF				Work Order: PROU0010					
Serial Number: EMC 0x100001				Date: 01/04/05					
Customer: Product Creation Studio				Temperature: 25°C					
Attendees: None				Tested by: Rod Peloquin				Humidity: 25% RH	
Customer Ref. No.: N/A				Power: Battery				Job Site: EV01	
TEST SPECIFICATIONS									
Specification: 47 CFR 15.247(a)(2)				Year: 2004		Method: FCC 97-114, ANSI C63.4		Year: 2003	
SAMPLE CALCULATIONS									
COMMENTS									
EUT OPERATING MODES									
Modulated by PRBS at maximum data rate									
DEVIATIONS FROM TEST STANDARD									
None									
REQUIREMENTS									
The minimum 6dB bandwidth is 500KHz									
RESULTS									
Pass				BANDWIDTH 1.76 MHz					
SIGNATURE									
 Tested By: _____									
DESCRIPTION OF TEST									
Occupied Bandwidth - Low Channel									



NORTHWEST EMC				EMISSIONS DATA SHEET				Rev BETA 01/30/01	
EUT: Q4 RF				Work Order: PROU0010					
Serial Number: EMC 0x100001				Date: 01/04/05					
Customer: Product Creation Studio				Temperature: 25°C					
Attendees: None		Tested by: Rod Peloquin		Humidity: 25% RH					
Customer Ref. No.: N/A		Power: Battery		Job Site: EV01					
TEST SPECIFICATIONS									
Specification: 47 CFR 15.247(a)(2)		Year: 2004		Method: FCC 97-114, ANSI C63.4		Year: 2003			
SAMPLE CALCULATIONS									
COMMENTS									
EUT OPERATING MODES									
Modulated by PRBS at maximum data rate									
DEVIATIONS FROM TEST STANDARD									
None									
REQUIREMENTS									
The minimum 6dB bandwidth is 500KHz									
RESULTS									
Pass				BANDWIDTH 1.66 MHz					
SIGNATURE									
 Tested By: _____									
DESCRIPTION OF TEST									
Occupied Bandwidth - Mid Channel									



NORTHWEST EMC				EMISSIONS DATA SHEET				Rev BETA 01/30/01	
EUT: Q4 RF				Work Order: PROU0010					
Serial Number: EMC 0x100001				Date: 01/04/05					
Customer: Product Creation Studio				Temperature: 25°C					
Attendees: None				Tested by: Rod Peloquin				Humidity: 25% RH	
Customer Ref. No.: N/A				Power: Battery				Job Site: EV01	
TEST SPECIFICATIONS									
Specification: 47 CFR 15.247(a)(2)			Year: 2004		Method: FCC 97-114, ANSI C63.4			Year: 2003	
SAMPLE CALCULATIONS									
COMMENTS									
EUT OPERATING MODES									
Modulated by PRBS at maximum data rate									
DEVIATIONS FROM TEST STANDARD									
None									
REQUIREMENTS									
The minimum 6dB bandwidth is 500KHz									
RESULTS									
Pass				BANDWIDTH 1.61 MHz					
SIGNATURE									
 Tested By: _____									
DESCRIPTION OF TEST									
Occupied Bandwidth - High Channel									





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

Typical

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

Battery

Frequency Range Investigated

Start Frequency	30 MHz	Stop Frequency	26 GHz
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Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing including channel, mode, and power.			

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
EUT- Q4 RF	Quizdom, Inc.	Q4 RF	EMC 0x100001

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/02/2004	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/02/2004	13 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo

Test Description

Requirement: Per 47 CFR 15.247(b)(3), the maximum peak output power must not exceed 1 Watt.

Configuration: The peak output power was measured with the EUT set to low, mid, and high transmit frequencies. The EUT was transmitting at its maximum output power and data rate.

The measurement was made using the alternative test procedure described in FCC 97-114. The maximum field strength of the fundamental was measured at a 3 meter distance. The field strength was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.4:2003).

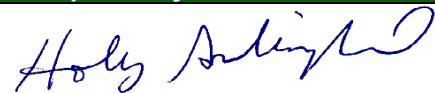
The peak EIRP was calculated using the equation:

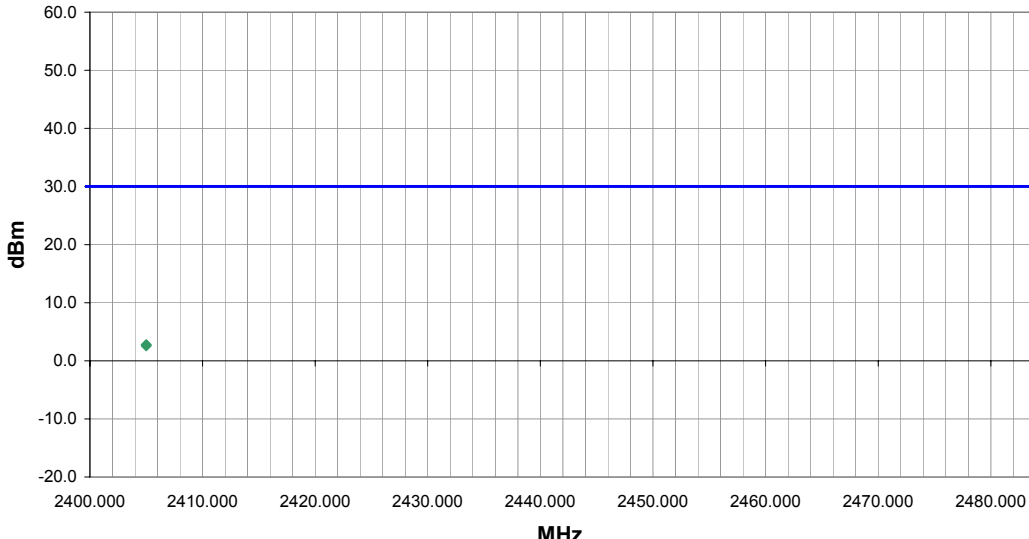
$$\text{EIRP} = (\text{Ed})^2 / 30$$

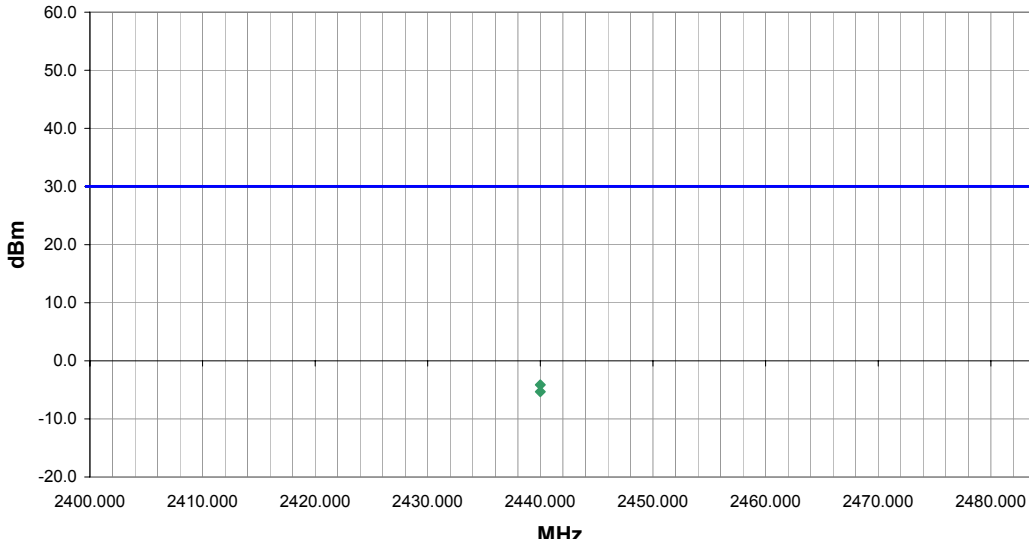
Where: E is the measured maximum field strength in V/m
D is the distance in meters from which the field strength was measured

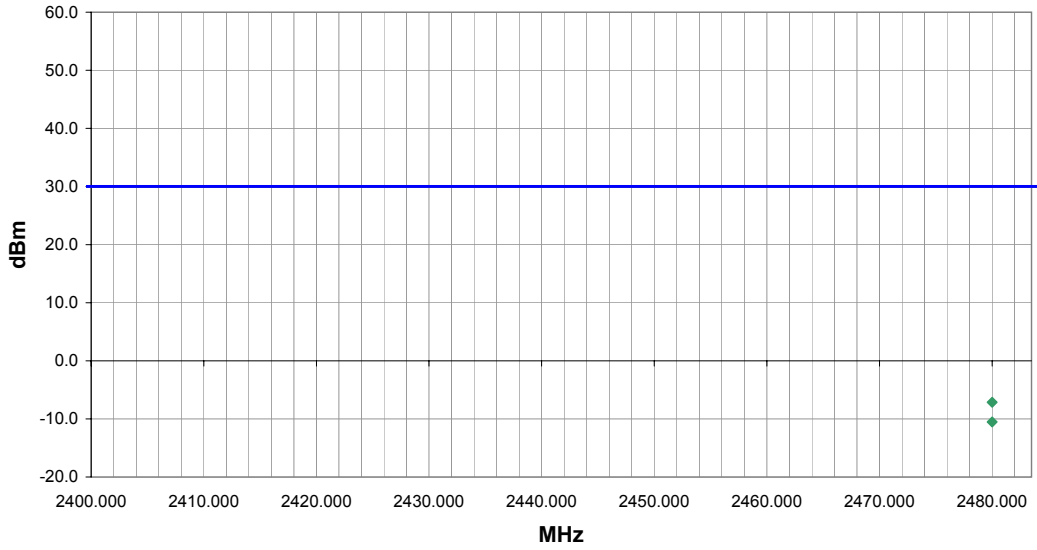
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.

Completed by:

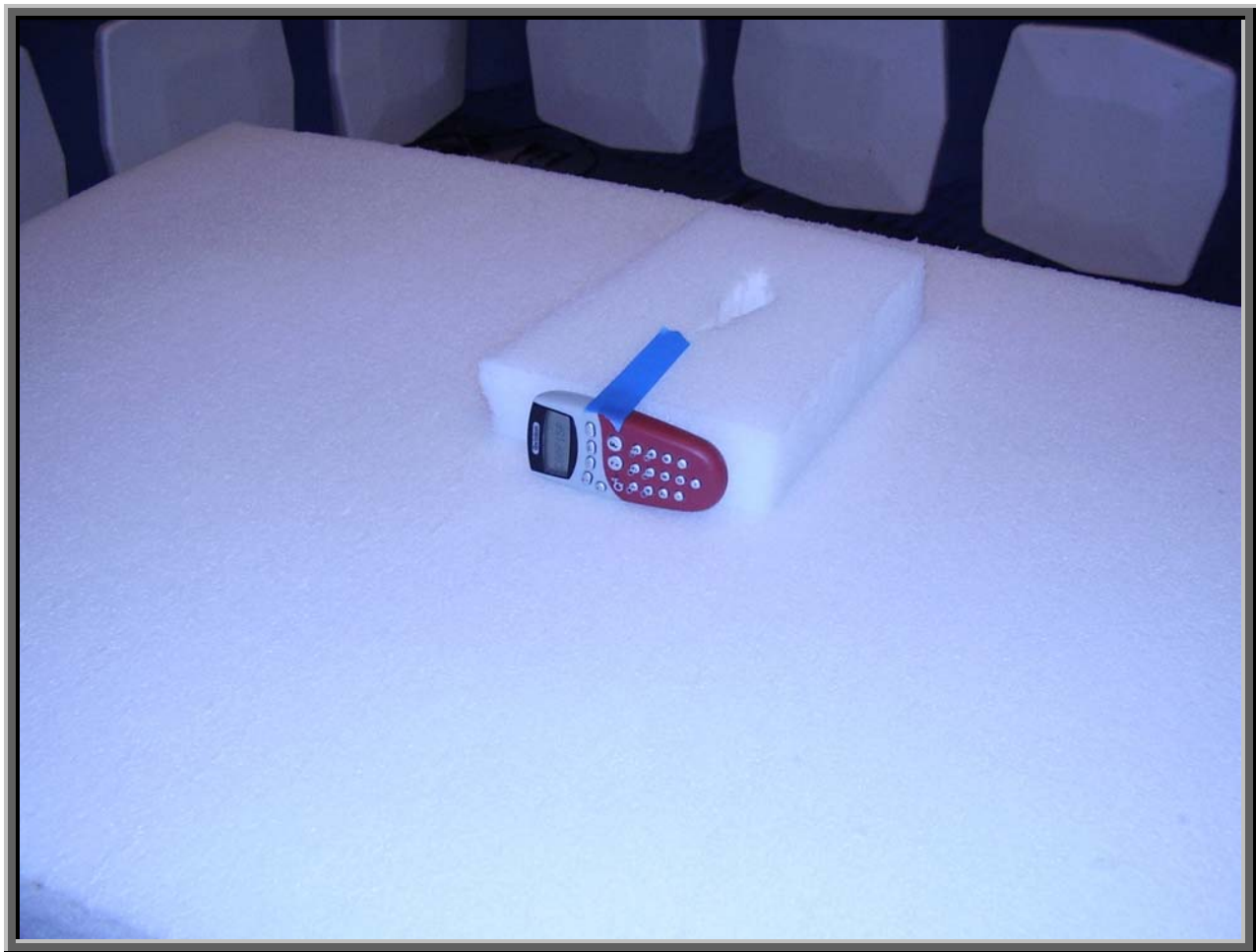


NORTHWEST EMC										Output Power - EIRP		ACQ 2005.1.3 EMI 2005.1.3	
EUT: Q4 RF		Work Order: PROU0010											
Serial Number: EMC 0x100001		Date: 01/08/05											
Customer: Product Creation Studio		Temperature: 19											
Attendees: None		Humidity: 32%											
Cust. Ref. No.:		Barometric Pressure: 30.5											
Tested by: Holly Ashkannejhad		Power: Battery		Job Site: EV01									
TEST SPECIFICATIONS													
Specification: FCC 15.247(b) Output Power : 2004						Method: ANSI C63.4:2003							
SAMPLE CALCULATIONS													
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation													
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator													
COMMENTS													
EUT OPERATING MODES													
No hop, low channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS										Run #			
Pass										11			
Other													
 Tested By:													
													
Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
2405.000			197.0	1.1			H-Horn	PK	0.0019	2.8	30.0	-27.2	EUT Horizontal.
2405.000			207.0	1.1			V-Horn	PK	0.0018	2.6	30.0	-27.4	EUT on side.

NORTHWEST EMC										Output Power - EIRP		ACQ 2005.1.3 EMI 2005.1.3	
EUT: Q4 RF		Work Order: PROU0010											
Serial Number: EMC 0x100001		Date: 01/08/05											
Customer: Product Creation Studio		Temperature: 19											
Attendees: None		Humidity: 32%											
Cust. Ref. No.:		Barometric Pressure: 30.5											
Tested by: Holly Ashkannejhad		Power: Battery		Job Site: EV01									
TEST SPECIFICATIONS													
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004						Method: ANSI C63.4:2003							
SAMPLE CALCULATIONS													
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation													
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator													
COMMENTS													
EUT OPERATING MODES													
No hop, mid channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS										Run #			
Pass										12			
Other													
 Tested By:													
													
Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
2440.000			254.0	1.1			V-Horn	PK	0.0004	-4.1	30.0	-34.1	EUT on side.
2440.000			115.0	1.7			H-Horn	PK	0.0003	-5.3	30.0	-35.3	EUT Horizontal.

NORTHWEST EMC										Output Power - EIRP										ACQ 2005.1.3 EMI 2005.1.3	
EUT: Q4 RF										Work Order: PROU0010											
Serial Number: EMC 0x100001										Date: 01/08/05											
Customer: Product Creation Studio										Temperature: 19											
Attendees: None										Humidity: 32%											
Cust. Ref. No.:										Barometric Pressure: 30.5											
Tested by: Holly Ashkannejhad										Power: Battery										Job Site: EV01	
TEST SPECIFICATIONS																					
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004										Method: ANSI C63.4:2003											
SAMPLE CALCULATIONS																					
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation																					
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator																					
COMMENTS																					
EUT OPERATING MODES																					
No hop, high channel																					
DEVIATIONS FROM TEST STANDARD																					
No deviations.																					
RESULTS																					
Pass																Run #					
																13					
Other																					
										 Tested By:											
																					
Freq (MHz)		Azimuth (degrees)		Height (meters)		Polarity		Detector		EIRP (Watts)		EIRP (dBm)		Spec. Limit (dBm)		Compared to Spec. (dB)		Comments			
2480.000		251.0		1.1		H-Horn		PK		0.0002		-7.1		30.0		-37.1		EUT horizontal.			
2480.000		96.0		1.1		V-Horn		PK		0.0001		-10.5		30.0		-40.5		EUT on side.			





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

Typical

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

Battery

Software\Firmware Applied During Test

Exercise software	TestRFGGen	Version	1.0
Description			
The system was tested using special software developed to test all functions of the device during the test.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Quizdom, Inc.	Q4 RF	EMC 0x100001

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo

Test Description

Requirement: Per 47 CFR 15.247(e), the peak power spectral density conducted from the antenna port of a direct sequence transmitter must not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

Configuration: The peak power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The EUT was transmitting at its maximum data rate.

The measurement was made using the alternative test procedure described in FCC 97-114. The maximum field strength of the fundamental was measured at a 3 meter distance. The field strength was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.4:2003). Then the analyzer was tuned to the highest point of the maximized fundamental emission and reset per the procedure outlined in FCC 97-114:

The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be $1.5 \times 10^6 \div 3 \times 10^3 = 500$ seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.8 dB for correction to 3 kHz."

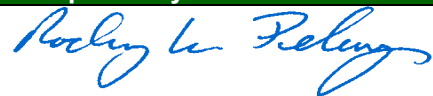
The spectrum analyzer display was internally offset by a correction factor equal to the antenna factor (dB/m) plus the cable loss (dB) minus the preamp gain plus external attenuation plus a field strength (dBm/m) to EIRP (dBm) conversion factor of 11.77dB. The conversion factor of 11.77 dB was derived from the equation:

$$\text{EIRP} = (\text{Ed})^2 / 30$$

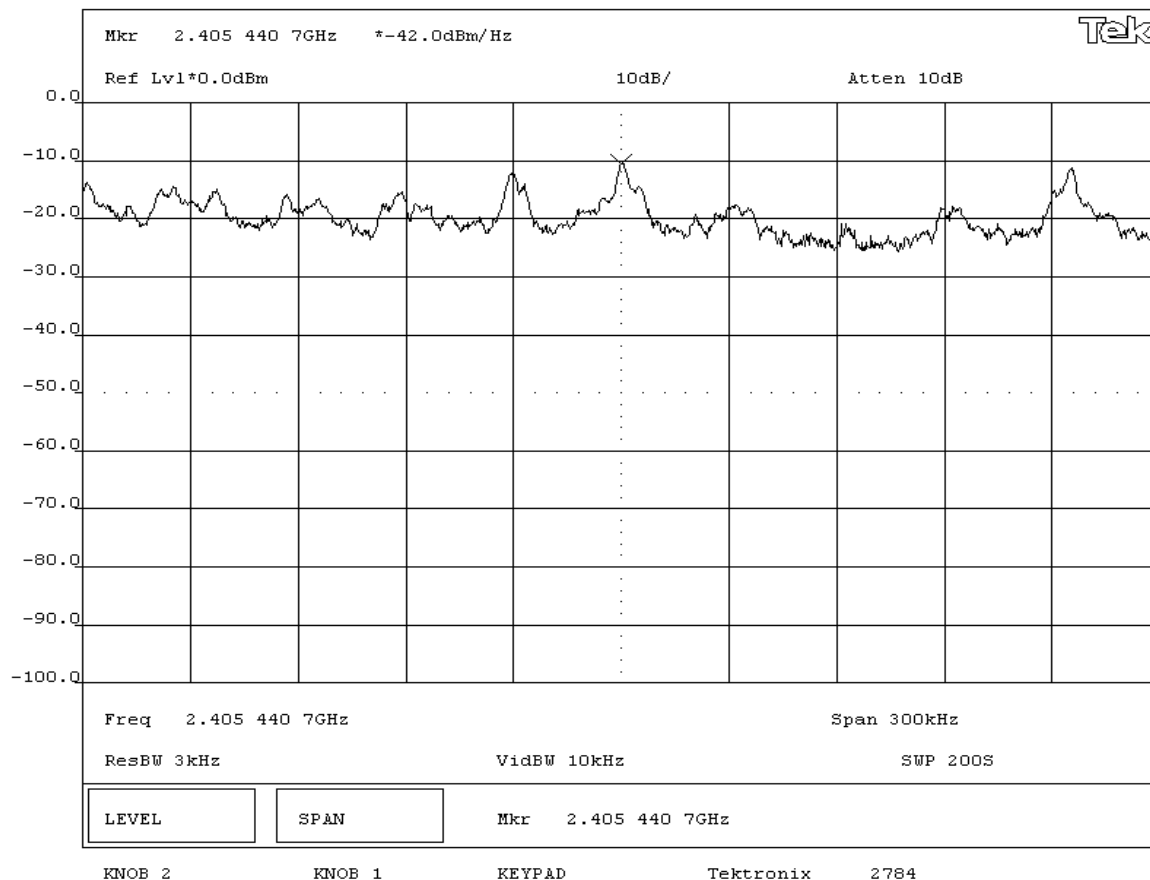
Where: E is the measured maximum field strength in V/m
d is the distance in meters from which the field strength was measured (3 meters)
EIRP is in W

The bandwidth correction factor of 34.8 dB was added to the marker noise value (dBm/Hz) on the spectrum analyzer display to convert it to dBm/3kHz for comparison with the limit.

Completed by:



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: Q4 RF			Work Order: PROU0010		
Serial Number: EMC 0x100001			Date: 01/04/05		
Customer: Product Creation Studio			Temperature: 23°C		
Attendees: None		Tested by: Rod Peloquin		Humidity: 25% RH	
Customer Ref. No.: N/A		Power: Battery		Job Site: EV06	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(e)		Year: 2004		Method: FCC 97-114, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
Marker level on spectrum analyzer is compensated with reference level offset					
Field Strength per 3 kHz bandwidth = Marker level + Bandwidth Correction Factor					
Bandwidth Correction Factor = $10 \cdot \log(3 \text{ kHz} / 1 \text{ Hz}) = 34.8 \text{ dB}$					
EIRP = $(E_d)^2 / 30$, where E is the Field Strength in V/m/3kHz, d is the 3 meter measurement distance, and EIRP is in Watts/3kHz					
COMMENTS					
Analyzer reference level offset = (antenna factor + cable loss - preamp gain +10 dB external attenuation) + EIRP conversion factor (11.77dB) = 19.37 dB					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band					
RESULTS			AMPLITUDE		
Pass			Power Spectral Density = -7.2 dBm / 3kHz		
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Power Spectral Density - Low Channel					



NORTHWEST
EMC**EMISSIONS DATA SHEET**Rev BETA
01/30/01

EUT: Q4 RF		Work Order: PROU0010
Serial Number: EMC 0x100001		Date: 01/04/05
Customer: Product Creation Studio		Temperature: 23°C
Attendees: None	Tested by: Rod Peloquin	Humidity: 25% RH
Customer Ref. No.: N/A	Power: Battery	Job Site: EV06

TEST SPECIFICATIONS

Specification: 47 CFR 15.247(e)	Year: 2004	Method: FCC 97-114, ANSI C63.4	Year: 2003
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SAMPLE CALCULATIONS

Marker level on spectrum analyzer is compensated with reference level offset

Field Strength per 3 kHz bandwidth = Marker level + Bandwidth Correction Factor

Bandwidth Correction Factor = $10 \cdot \log(3 \text{ kHz} / 1 \text{ Hz}) = 34.8 \text{ dB}$ EIRP = $(E_d)^2 / 30$, where E is the Field Strength in V/m/3kHz, d is the 3 meter measurement distance, and EIRP is in Watts/3kHz**COMMENTS**

Analyzer reference level offset = (antenna factor + cable loss - preamp gain +10 dB external attenuation) + EIRP conversion factor (11.77dB) = 19.37 dB

EUT OPERATING MODES

Modulated at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

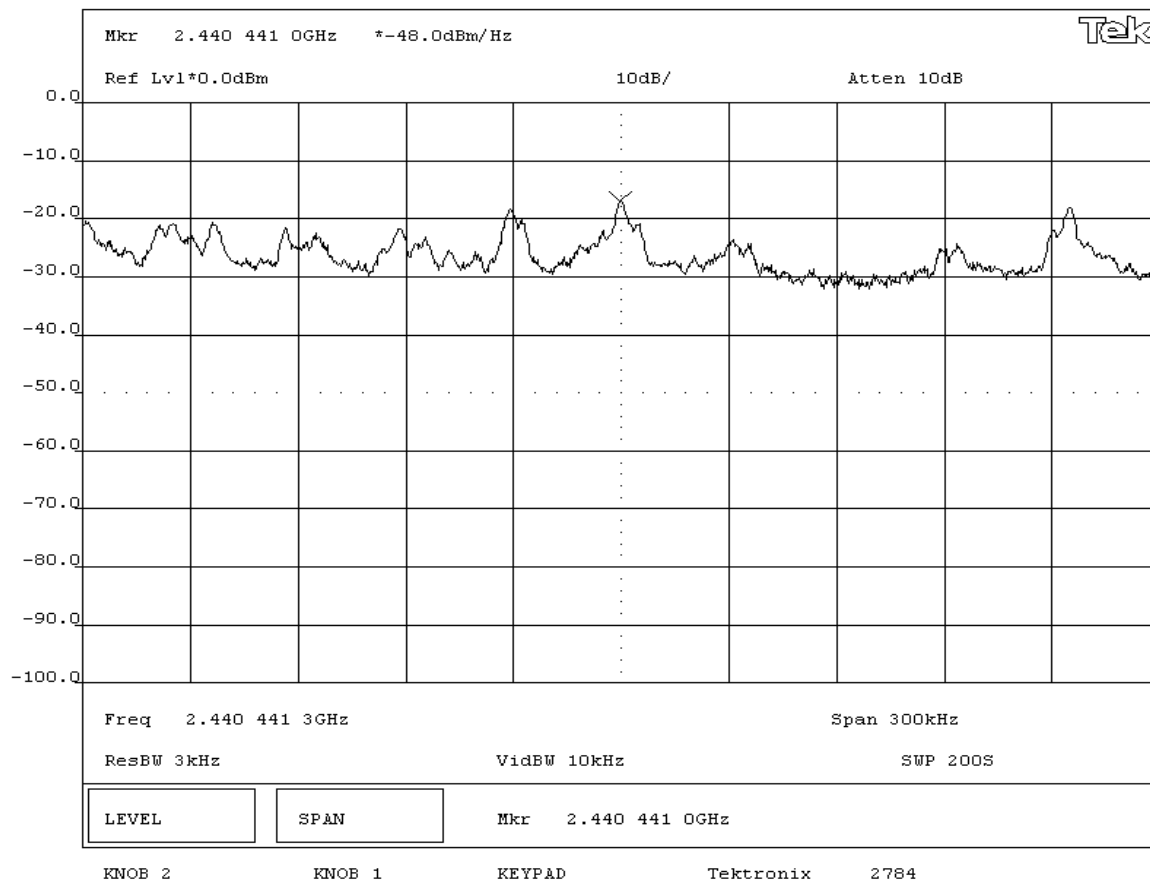
REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

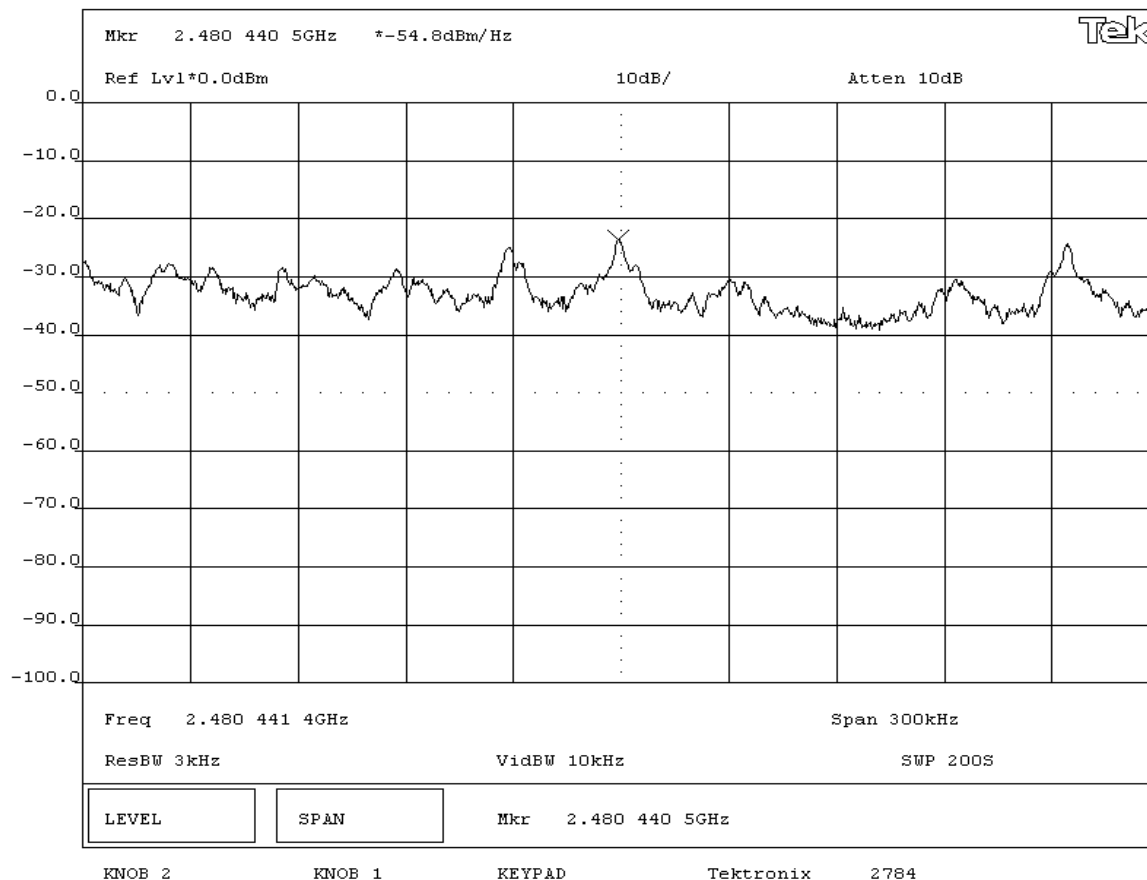
RESULTS**AMPLITUDE**

Pass

Power Spectral Density = -13.2 dBm / 3kHz

SIGNATURE
Tested By: _____**DESCRIPTION OF TEST****Power Spectral Density - Mid Channel**

NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: Q4 RF			Work Order: PROU0010		
Serial Number: EMC 0x100001			Date: 01/04/05		
Customer: Product Creation Studio			Temperature: 23°C		
Attendees: None		Tested by: Rod Peloquin		Humidity: 25% RH	
Customer Ref. No.: N/A		Power: Battery		Job Site: EV06	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(e)		Year: 2004		Method: FCC 97-114, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
Marker level on spectrum analyzer is compensated with reference level offset					
Field Strength per 3 kHz bandwidth = Marker level + Bandwidth Correction Factor					
Bandwidth Correction Factor = $10 \cdot \log(3 \text{ kHz} / 1 \text{ Hz}) = 34.8 \text{ dB}$					
$\text{EIRP} = (\text{Ed})^2 / 30$, where E is the Field Strength in V/m/3kHz, d is the 3 meter measurement distance, and EIRP is in Watts/3kHz					
COMMENTS					
Analyzer reference level offset = (antenna factor + cable loss - preamp gain +10 dB external attenuation) + EIRP conversion factor (11.77dB) = 19.37 dB					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band					
RESULTS			AMPLITUDE		
Pass			Power Spectral Density = -20.0 dBm / 3kHz		
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Power Spectral Density - High Channel					





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low

Mid

High

Operating Modes Investigated:

Transmit

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

Battery

Frequency Range Investigated**Start Frequency**

30 MHz

Stop Frequency

26 GHz

Software\Firmware Applied During Test**Exercise software**

Standard Production Software

Version

Unknown

Description

The system was tested using standard operating production software to exercise the functions of the device during the testing including channel, mode, and power.

EUT and Peripherals in Test Setup Boundary**Description****Manufacturer****Model/Part Number****Serial Number**

EUT- Q4 RF

Quizdom, Inc.

Q4 RF

EMC 0x100001

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Antenna, Horn	EMCO	3160-09	AHG	NCR	NA
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/08/2003	15 mo
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	NA
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	10/08/2003	15 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
Pre-Amplifier	AR	LN1000A	APS	02/05/2004	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
High Pass Filter	Micro-Tronics	HPM50111	HFO	04/13/2004	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/02/2004	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/02/2004	13 mo

Test Description

Requirement: The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

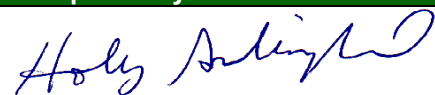
Configuration: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2003). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Bandwidths Used for Measurements

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

Completed by:



NORTHWEST

EMC

RADIATED EMISSIONS DATA SHEET

REV
df4.7
12/21/2004

EUT: Q4 RF				Work Order: PROU0010			
Serial Number: EMC 0x100001				Date: 12/22/04			
Customer: Product Creation Studio				Temperature: 23			
Attendees: None				Humidity: 33%			
Cust. Ref. No.:				Barometric Pressure: 30.5			
Tested by: Dan Haas				Power: Battery		Job Site: EV01	

TEST SPECIFICATIONS

Specification: FCC 15.247(d) Spurious Radiated Emissions:2004	Method: ANSI C63.4:2003
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

No hop, high channel

DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS

Run #
Pass
1

Other

Tested By:

80.0

70.0

60.0

50.0

40.0

30.0

20.0

10.0

0.0

1000.000

1200.000

1400.000

1600.000

1800.000

2000.000

2200.000

2400.000

2600.000

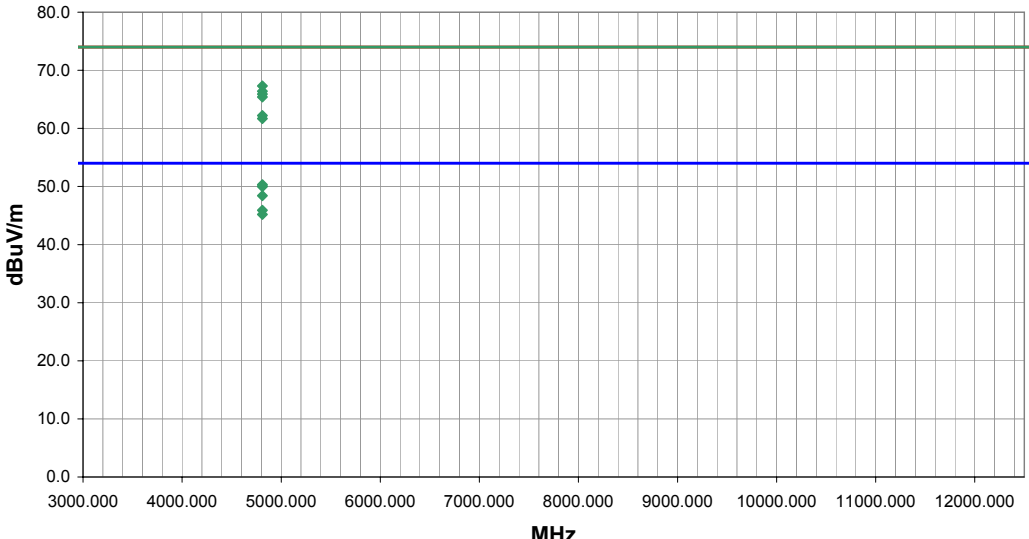
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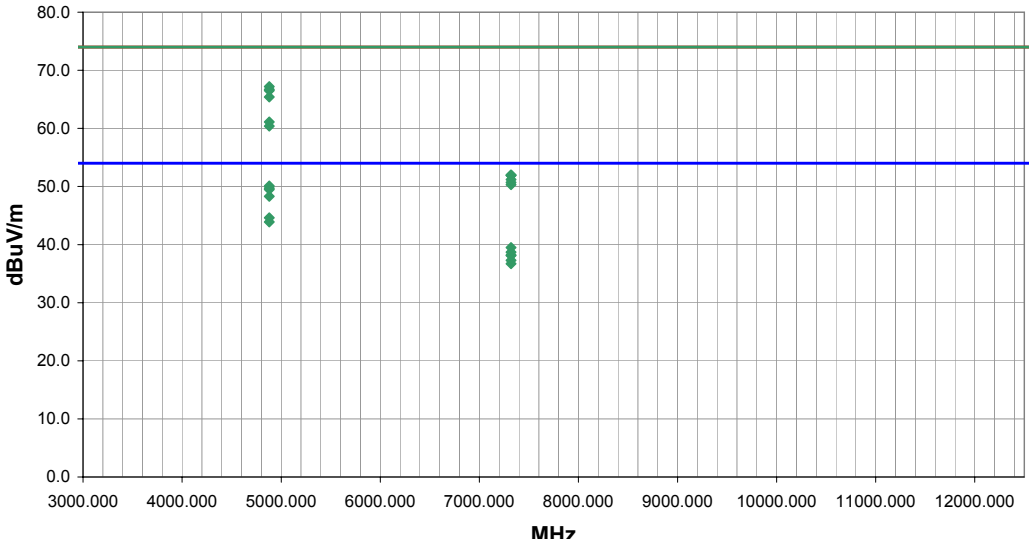
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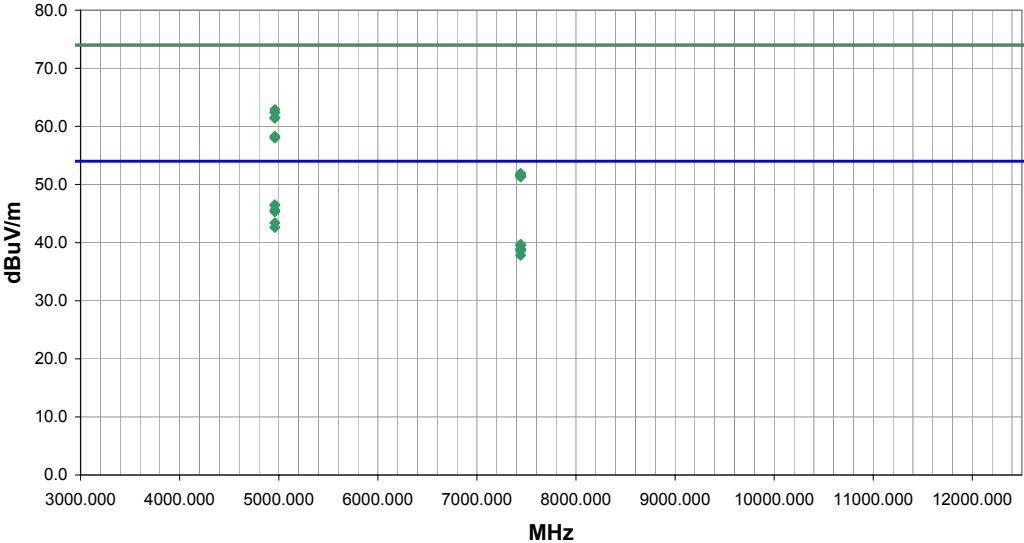
dBuV/m

MHz

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2483.500	53.8	-2.2	340.0	1.3	3.0	10.0	H-Horn	PK	0.0	61.6	74.0	-12.4 #1. EUT Vertical	
2483.500	53.0	-2.2	165.0	1.4	3.0	10.0	H-Horn	PK	0.0	60.8	74.0	-13.2 #3. EUT Horizontal	
2483.500	30.4	-2.2	340.0	1.3	3.0	10.0	H-Horn	AV	0.0	38.2	54.0	-15.8 #1. EUT Vertical	
2483.500	30.4	-2.2	165.0	1.4	3.0	10.0	H-Horn	AV	0.0	38.2	54.0	-15.8 #3. EUT Horizontal	
2483.500	29.9	-2.2	116.0	1.2	3.0	10.0	V-Horn	AV	0.0	37.7	54.0	-16.3 #1. EUT Vertical	
2483.500	29.9	-2.2	97.0	1.1	3.0	10.0	V-Horn	AV	0.0	37.7	54.0	-16.3 #2. EUT on its side.	
2483.500	29.8	-2.2	274.0	1.1	3.0	10.0	V-Horn	AV	0.0	37.6	54.0	-16.4 #3. EUT Horizontal	
2483.500	29.7	-2.2	92.0	1.3	3.0	10.0	H-Horn	AV	0.0	37.5	54.0	-16.5 #2. EUT on its side.	
2483.500	49.4	-2.2	274.0	1.1	3.0	10.0	V-Horn	PK	0.0	57.2	74.0	-16.8 #3. EUT Horizontal	
2483.500	47.7	-2.2	116.0	1.2	3.0	10.0	V-Horn	PK	0.0	55.5	74.0	-18.5 #1. EUT Vertical	
2483.500	47.4	-2.2	97.0	1.1	3.0	10.0	V-Horn	PK	0.0	55.2	74.0	-18.8 #2. EUT on its side.	
2483.500	45.8	-2.2	92.0	1.3	3.0	10.0	H-Horn	PK	0.0	53.6	74.0	-20.4 #2. EUT on its side.	

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV d14.7 12/21/2004	
EUT: Q4 RF		Work Order: PROU0010													
Serial Number: EMC 0x100001		Date: 12/22/04													
Customer: Product Creation Studio		Temperature: 23													
Attendees: None		Humidity: 33%													
Cust. Ref. No.:		Barometric Pressure: 30.5													
Tested by: Dan Haas		Power: Battery		Job Site: EV01											
TEST SPECIFICATIONS															
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004						Method: ANSI C63.4:2003									
SAMPLE CALCULATIONS															
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation															
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator															
COMMENTS															
EUT OPERATING MODES															
No hop, Low channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS															
Pass												Run #			
												2			
Other															
 Tested By:															
															
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments		
4810.000	47.0	3.3	98.0	1.3	3.0	0.0	V-Horn	AV	0.0	50.3	54.0	-3.7	EUT on its side.		
4810.000	46.7	3.3	19.0	1.2	3.0	0.0	H-Horn	AV	0.0	50.0	54.0	-4.0	EUT Horizontal		
4810.000	46.7	3.3	17.0	1.3	3.0	0.0	V-Horn	AV	0.0	50.0	54.0	-4.0	EUT Vertical		
4810.000	45.1	3.3	170.0	1.2	3.0	0.0	H-Horn	AV	0.0	48.4	54.0	-5.6	EUT on its side.		
4810.000	64.0	3.3	17.0	1.3	3.0	0.0	V-Horn	PK	0.0	67.3	74.0	-6.7	EUT Vertical		
4810.000	63.1	3.3	98.0	1.3	3.0	0.0	V-Horn	PK	0.0	66.4	74.0	-7.6	EUT on its side.		
4810.000	62.6	3.3	19.0	1.2	3.0	0.0	H-Horn	PK	0.0	65.9	74.0	-8.1	EUT Horizontal		
4810.000	42.6	3.3	158.0	1.7	3.0	0.0	H-Horn	AV	0.0	45.9	54.0	-8.1	EUT Vertical		
4810.000	62.1	3.3	170.0	1.2	3.0	0.0	H-Horn	PK	0.0	65.4	74.0	-8.6	EUT on its side.		
4810.000	41.9	3.3	227.0	1.2	3.0	0.0	V-Horn	AV	0.0	45.2	54.0	-8.8	EUT Horizontal		
4810.000	58.9	3.3	227.0	1.2	3.0	0.0	V-Horn	PK	0.0	62.2	74.0	-11.8	EUT Horizontal		
4810.000	58.4	3.3	158.0	1.7	3.0	0.0	H-Horn	PK	0.0	61.7	74.0	-12.3	EUT Vertical		

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET										REV d14.7 12/21/2004	
EUT: Q4 RF										Work Order: PROU0010											
Serial Number: EMC 0x100001										Date: 12/22/04											
Customer: Product Creation Studio										Temperature: 23											
Attendees: None										Humidity: 33%											
Cust. Ref. No.:										Barometric Pressure 30.5											
Tested by: Dan Haas										Power: Battery										Job Site: EV01	
TEST SPECIFICATIONS																					
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004										Method: ANSI C63.4:2003											
SAMPLE CALCULATIONS																					
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation																					
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator																					
COMMENTS																					
EUT OPERATING MODES																					
No hop, Mid channel																					
DEVIATIONS FROM TEST STANDARD																					
No deviations.																					
RESULTS																					
Pass																				Run #	
																				3	
Other										 Tested By: _____											
																					
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments								
4880.000	46.5	3.6	153.0	1.2	3.0	0.0	H-Horn	AV	0.0	50.1	54.0	-3.9	EUT Horizontal								
4880.000	46.1	3.6	109.0	1.3	3.0	0.0	V-Horn	AV	0.0	49.7	54.0	-4.3	EUT on its side.								
4880.000	45.9	3.6	8.0	1.4	3.0	0.0	V-Horn	AV	0.0	49.5	54.0	-4.5	EUT Vertical								
4880.000	44.7	3.6	169.0	1.2	3.0	0.0	H-Horn	AV	0.0	48.3	54.0	-5.7	EUT on its side.								
4880.000	63.6	3.6	153.0	1.2	3.0	0.0	H-Horn	PK	0.0	67.2	74.0	-6.8	EUT Horizontal								
4880.000	63.1	3.6	8.0	1.4	3.0	0.0	V-Horn	PK	0.0	66.7	74.0	-7.3	EUT Vertical								
4880.000	62.9	3.6	109.0	1.3	3.0	0.0	V-Horn	PK	0.0	66.5	74.0	-7.5	EUT on its side.								
4880.000	61.8	3.6	169.0	1.2	3.0	0.0	H-Horn	PK	0.0	65.4	74.0	-8.6	EUT on its side.								
4880.000	41.0	3.6	156.0	1.3	3.0	0.0	H-Horn	AV	0.0	44.6	54.0	-9.4	EUT Vertical								
4880.000	40.3	3.6	341.0	1.2	3.0	0.0	V-Horn	AV	0.0	43.9	54.0	-10.1	EUT Horizontal								
4880.000	57.5	3.6	341.0	1.2	3.0	0.0	V-Horn	PK	0.0	61.1	74.0	-12.9	EUT Horizontal								
4880.000	56.8	3.6	156.0	1.3	3.0	0.0	H-Horn	PK	0.0	60.4	74.0	-13.6	EUT Vertical								
7320.000	29.0	10.5	156.0	1.1	3.0	0.0	V-Horn	AV	0.0	39.5	54.0	-14.5	EUT Horizontal								
7320.000	28.2	10.5	62.0	2.2	3.0	0.0	H-Horn	AV	0.0	38.7	54.0	-15.3	EUT on its side.								
7320.000	27.7	10.5	145.0	1.3	3.0	0.0	H-Horn	AV	0.0	38.2	54.0	-15.8	EUT Vertical								
7320.000	27.6	10.5	243.0	1.7	3.0	0.0	V-Horn	AV	0.0	38.1	54.0	-15.9	EUT on its side.								
7320.000	26.8	10.5	103.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.3	54.0	-16.7	EUT Vertical								
7320.000	26.2	10.5	204.0	1.3	3.0	0.0	H-Horn	AV	0.0	36.7	54.0	-17.3	EUT Horizontal								
7320.000	41.5	10.5	145.0	1.3	3.0	0.0	H-Horn	PK	0.0	52.0	74.0	-22.0	EUT Vertical								
7320.000	41.4	10.5	156.0	1.1	3.0	0.0	V-Horn	PK	0.0	51.9	74.0	-22.1	EUT Horizontal								

NORTHWEST		REV											
EMC		d14.7											
12/21/2004													
RADIATED EMISSIONS DATA SHEET													
EUT: Q4 RF		Work Order: PROU0010											
Serial Number: EMC 0x100001		Date: 12/22/04											
Customer: Product Creation Studio		Temperature: 23											
Attendees: None		Humidity: 33%											
Cust. Ref. No.:		Barometric Pressure: 30.5											
Tested by: Dan Haas		Power: Battery											
		Job Site: EV01											
TEST SPECIFICATIONS													
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004		Method: ANSI C63.4:2003											
SAMPLE CALCULATIONS													
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation													
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator													
COMMENTS													
EUT OPERATING MODES													
No hop, High channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS		Run #											
Pass		4											
Other													
		Tested By:											
													
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
4960.000	42.9	3.6	337.0	1.3	3.0	0.0	H-Horn	AV	0.0	46.5	54.0	-7.5	EUT Horizontal
4960.000	42.8	3.6	108.0	1.6	3.0	0.0	V-Horn	AV	0.0	46.4	54.0	-7.6	EUT on its side
4960.000	42.0	3.6	274.0	1.2	3.0	0.0	V-Horn	AV	0.0	45.6	54.0	-8.4	EUT Vertical
4960.000	41.7	3.6	181.0	1.1	3.0	0.0	H-Horn	AV	0.0	45.3	54.0	-8.7	EUT on its side
4960.000	39.8	3.6	330.0	1.8	3.0	0.0	H-Horn	AV	0.0	43.4	54.0	-10.6	EUT Vertical
4960.000	59.3	3.6	108.0	1.6	3.0	0.0	V-Horn	PK	0.0	62.9	74.0	-11.1	EUT on its side
4960.000	39.0	3.6	182.0	1.2	3.0	0.0	V-Horn	AV	0.0	42.6	54.0	-11.4	EUT Horizontal
4960.000	58.8	3.6	337.0	1.3	3.0	0.0	H-Horn	PK	0.0	62.4	74.0	-11.6	EUT Horizontal
4960.000	57.9	3.6	181.0	1.1	3.0	0.0	H-Horn	PK	0.0	61.5	74.0	-12.5	EUT on its side
4960.000	57.8	3.6	274.0	1.2	3.0	0.0	V-Horn	PK	0.0	61.4	74.0	-12.6	EUT Vertical
7440.000	28.6	11.1	211.0	1.3	3.0	0.0	H-Horn	AV	0.0	39.7	54.0	-14.3	EUT Vertical
7440.000	28.4	11.1	191.0	1.3	3.0	0.0	H-Horn	AV	0.0	39.5	54.0	-14.5	EUT on its side
7440.000	27.8	11.1	248.0	1.9	3.0	0.0	H-Horn	AV	0.0	38.9	54.0	-15.1	EUT Horizontal
7440.000	27.7	11.1	224.0	1.2	3.0	0.0	V-Horn	AV	0.0	38.8	54.0	-15.2	EUT Vertical
7440.000	27.5	11.1	305.0	1.2	3.0	0.0	V-Horn	AV	0.0	38.6	54.0	-15.4	EUT Horizontal
4960.000	54.7	3.6	182.0	1.2	3.0	0.0	V-Horn	PK	0.0	58.3	74.0	-15.7	EUT Horizontal
4960.000	54.4	3.6	330.0	1.8	3.0	0.0	H-Horn	PK	0.0	58.0	74.0	-16.0	EUT Vertical
7440.000	26.7	11.1	86.0	1.9	3.0	0.0	V-Horn	AV	0.0	37.8	54.0	-16.2	EUT on its side
7440.000	40.8	11.1	211.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.9	74.0	-22.1	EUT Vertical
7440.000	40.5	11.1	224.0	1.2	3.0	0.0	V-Horn	PK	0.0	51.6	74.0	-22.4	EUT Vertical



